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Assessing Mothers' Knowledge of Childhood Immunization

Abstract

Background: Despite global efforts, 108 million infants (84%) received three doses of the diphtheria, tetanus, and pertussis (DTP3) vaccine in 2023. However, in Yemen, millions of children missed routine immunizations, and only 30% of children under the age of three were fully immunized during the same year.

Aim: This study aimed to assess mothers' knowledge of childhood immunization for children under five years of age at Jiblah University Hospital, Ibb, Yemen.

Methods: A descriptive, community-based cross-sectional study was conducted between September 2023 and March 2024. The study included 300 mothers attending the maternal care and vaccination units at Jiblah University Hospital. Data were analyzed using descriptive statistics and the chi-square test.

Results: More than three-fifths of the mothers (62%) were over 25 years of age, and 48.3% had one to two children under five. The overall maternal knowledge score regarding childhood immunization was 77.7%. A statistically significant association was found between mothers' age and education level and their total knowledge score (p=0.044 and p=0.028, respectively). Notably, the majority of mothers aged 25 years or older (82.3%) and literate mothers (80%) demonstrated good knowledge.

Conclusion: Most mothers recognized the importance of vaccination in preventing disease and reducing infant mortality. However, gaps were identified in their understanding of vaccine side effects and immunization schedules.

Keywords: Child, knowledge, mothers, vaccine

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Introduction

Vaccination is one of the most effective and cost-efficient public health interventions for reducing diseases that contribute to child morbidity and mortality. However, ensuring that children are vaccinated against life-threatening yet preventable diseases remains a significant challenge—particularly in low- and middle-income countries—despite the availability of vaccines.[1] Several factors contribute to low vaccination rates, including widespread poverty, ongoing internal conflict, limited access to healthcare services, and vaccine hesitancy. These issues have led to the resurgence of many preventable diseases.[2] Parents play a vital role in protecting their families and safeguarding their children's health. A mother's knowledge of childhood vaccination significantly influences her behavior and plays a critical role in ensuring that her child receives complete immunization.[3] Various factors are associated with higher maternal knowledge of vaccination, including age, occupation, place of residence, family income, and educational level.[4]

According to the 2024 World Health Organization (WHO) report, approximately 14.5 million infants worldwide did not receive the first dose of the diphtheria, tetanus, and pertussis (DTP) vaccine, and 6.5 million received only partial vaccination due to limited access to immunization programs and essential health services. Notably, 60% of these under-vaccinated children live in just 10 countries, including Yemen.[5] Yemen continues to lag behind in vaccination coverage, placing the country at increased risk of disease outbreaks due to low immunization rates among infants and young children.[6] For example, only 30% of children under the age of three were fully immunized. Reports indicate that coverage for the measles, polio, and DTP vaccines was 41%, 46%, and 55%, respectively.[7] Therefore, this study aims to evaluate mothers' knowledge of childhood vaccination for children under the age of five at Jiblah University Hospital in Ibb, Yemen.

Research Questions

1. What is the current level of knowledge among mothers regarding the vaccination of children under five?
2. How do sociodemographic factors—such as age, education, number of children, and place of residence—influence mothers' knowledge about childhood vaccinations?

Materials and Methods

Study Design

This descriptive, community-based study employed a cross-sectional design. It targeted mothers who sought services at primary health care units (maternal care and vaccination rooms) of Jiblah University Hospital, located in Ibb Governorate, Yemen.

Population and Sample

During the study period, a total of 1,018 mothers attended the maternal care and vaccination units at the primary healthcare facility of Jiblah University Hospital to receive routine healthcare services. Mothers with

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at least one child under the age of five were eligible for inclusion in the study, while those who were pregnant for the first time or did not have children under five were excluded. Of the total, 901 mothers met the inclusion criteria, as they had children under the age of five. The required sample size was calculated using the SurveyMonkey sample size calculator (https://www.surveymonkey.com/), which indicated a minimum of 270 participants. To enhance the robustness of the study, 20 mothers who participated in a pilot test were included, along with an additional 10 participants to compensate for potential missing or incomplete data. As a result, the final sample comprised 300 mothers. Participants were recruited using a convenience sampling method.

Data Collection Tools

The questionnaire consisted of two sections. The first section included seven sociodemographic items: the mother's age, number of children under five, place of residence, marital status, level of education, employment status, and monthly household income. The second section included 16 True-False questions aimed at assessing the mother's knowledge of childhood vaccination. A scoring system was applied to each question to evaluate the level of knowledge. Respondents who scored below 50% were classified as having a poor level of knowledge, those scoring between 50% and 75% were considered to have a fair level of knowledge, and those scoring above 75% were regarded as having a good level of knowledge.

Reliability and Validity

The content validity of the questionnaire was assessed by a panel of five experts from the Faculties of Nursing and Midwifery at Jiblah University for Medical and Health Sciences. Additionally, a pilot study was conducted involving 20 mothers—approximately 15% of the total sample—who were subsequently included in the final study. The questionnaire demonstrated high internal consistency, with a Cronbach's alpha coefficient of 0.89. The instrument used to assess maternal knowledge was developed based on the findings of a previous study.[8]

Data Collection

Co-researchers conducted individual face-to-face interviews with participating mothers in a private setting to ensure confidentiality and privacy. Approximately 10 to 11 interviews were conducted per week, with each session lasting between 20 and 25 minutes. Data collection was carried out from September 2023 to March 2024. Participants were informed of their right to withdraw from the study at any time during the interview process.

Table 1. Sociodemographic characteristics of mothers (n=300)

Variable	Category	Frequency	%
Age	Less than 25 years	114	38
	25 years or older	186	62
	Mean±SD: 30.4±8.7, Range: 43		
Number of children	1–2	145	48.3
(<5 years)	3–5	119	39.7
	More than 5	36	12
Place of residence	Urban	177	59
	Rural	123	41
Marital status	Married	279	93
	Divorced	11	3.7
	Widowed	10	3.3
Educational level	Illiterate	40	13.3
	Literate	260	86.7
Employment status	Employed	40	13.3
	Unemployed	260	86.7
Monthly family income (YRs)	Less than 60,000	56	18.7
	61,000–90000	187	62.3
	More than 90,000	57	19

SD: Standard deviation

Ethical Considerations

This study was conducted following approval from the Research Ethics Committee of Jiblah University for Medical and Health Sciences, Faculty of Nursing (Approval Number: 2024.2.5, Date: 08.09.2024). Verbal consent was obtained from all participating mothers prior to data collection. Participants were informed that their participation was voluntary and that they had the right to withdraw at any point during the interview. To ensure anonymity and confidentiality, participants' names were not recorded on the questionnaire. The study adhered to the ethical principles outlined in the Declaration of Helsinki, safeguarding the rights, dignity, and well-being of all participants throughout the research process.

Data Analysis

Data collected in this study were analyzed using the Statistical Package for the Social Sciences (SPSS), version 26.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics—including frequencies, percentages, means, and standard deviations—were used to summarize the data. The Chi-square test was applied to assess associations between mothers' knowledge and various sociodemographic variables. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1 presents the distribution of participants according to various sociodemographic characteristics, including age, number of children, place of residence, marital status, educational level, employment status, and monthly family income. The participants' ages ranged from 19 to 43 years, with a mean age of 30.4±8.7 years. The majority of mothers (62%) were aged 25 years or older. In terms of the number of children, 48.3% of mothers had one to two children, 39.7% had three to five children, and 12% had more than five children. Regarding place of residence, 59% of the participants lived in urban areas, while 41% resided in rural areas. Most of the mothers (93%) were married, while 3.7% were divorced and 3.3% were widowed. In terms of educational attainment, 86.7% of the mothers were literate, and 13.3% were illiterate. Concerning employment status, 86.7% were housewives, while 13.3% were employed outside the home.

As shown in Table 2, the frequencies and percentages related to mothers' knowledge of childhood vaccination are presented. The majority of mothers (92%) reported that their

Table 2. Mothers' knowledge about childhood vaccination (n=300)

No.	Knowledge item	Correct responses	
		n	%
1	Has your child received the mandatory vaccines?	277	92.0
2	Is vaccination important for children from the first month of birth?	273	90.7
3	Does vaccination protect your children from infectious diseases?	284	94.4
4	Does vaccination reduce infant mortality and disability?	277	92.0
5	Can vaccination help keep your children healthy?	287	95.4
6	Do some vaccines cause fever and pain?	285	94.7
7	Does vaccination cause cramps and rashes in children?	62	20.6
8	Can diphtheria, tetanus, and pertussis be controlled by vaccination?	256	85.1
9	Can childhood vaccination prevent the emergence of measles?	264	87.7
10	Can hepatitis B infection be prevented through vaccination?	234	77.7
11	Does your child need vaccination even when healthy?	285	94.7
12	Do you still vaccinate your child in cases of fever and diarrhea?	167	55.5
13	Have you ever been late in vaccinating your child?	86	28.6
14	Has your child received all the necessary vaccines?	274	91.03
15	Have you received maternal vaccines to protect your child from diseases?	203	67.4
16	Have you attended any health education campaign or course about vaccination?	186	61.8

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children had received the mandatory vaccinations, while 8% indicated that they had not ensured this type of immunization. Additionally, 90.7% of mothers recognized the importance of initiating vaccination on the first day of birth, whereas 9.3% were unaware of this recommendation. Regarding disease prevention and control, most mothers believed that vaccination protects children from infectious diseases (94.4%) and contributes to reducing both infant mortality and disability rates (92%). Furthermore, 85.1% of mothers reported that vaccination is effective in controlling diphtheria, tetanus, and pertussis, while 87.7% recognized its effectiveness against measles. Additionally, 77.7% of mothers indicated that hepatitis B virus infection can be prevented through vaccination.

Finally, 94.7% of mothers acknowledged that fever and pain are common side effects associated with vaccination. A smaller proportion (20.6%) believed that vaccination causes cramps and rashes, whereas the majority (79.4%) reported not observing these symptoms in their children following vaccination. These responses reflect the mothers' knowledge as well as their personal experiences regarding potential vaccine-related complications. Furthermore, the vast majority of mothers (94.7%) affirmed that vaccination is essential for maintaining child health. Slightly more than two-thirds (67.4%) believed that maternal vaccination plays a crucial role in protecting children from diseases, while 32.6% considered it to be unimportant. Additionally, over three-fifths of mothers (61.8%) reported having attended health education sessions on vaccination.

Figure 1 illustrates the overall knowledge scores of mothers regarding childhood vaccination. The results show that more than three-quarters of the mothers (77.7%) demonstrated a good level of knowledge, 17.7% had a fair level of knowledge, and only 4.6% exhibited poor knowledge regarding childhood vaccination.

Table 3 presents the association between various sociodemographic characteristics and the overall knowledge scores of mothers regarding childhood vaccination. The analysis revealed statistically significant differences in knowledge scores based on maternal age and educational level. Specifically, 82.3% of mothers aged over 25 years demonstrated good knowledge, compared to 70.2% of those aged 25 years

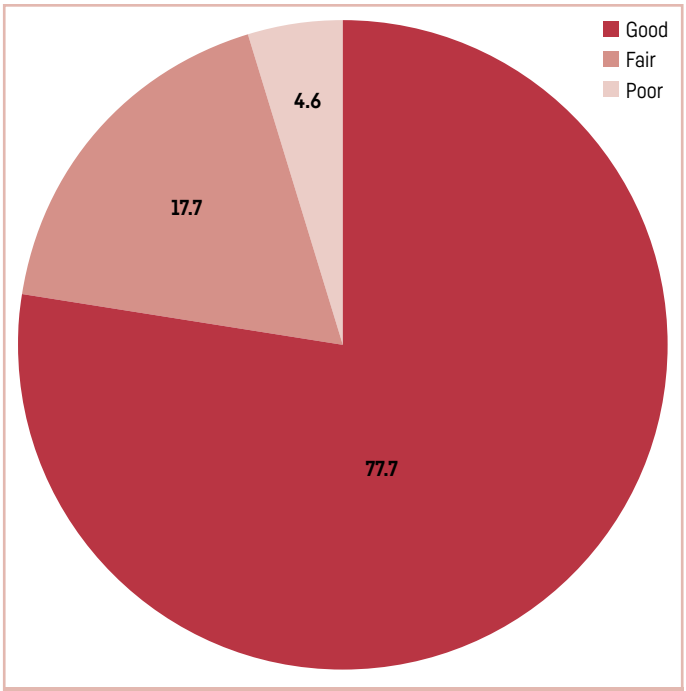


Figure 1. Distribution of mothers' total knowledge about childhood vaccination.

Table 3. Association between sociodemographic characteristics and mothers' total knowledge scores about childhood vaccination (n=300)

Variable	Mothers' knowledge of childhood vaccination						Statistical analysis	
	Poor (n=14)		Fair (n=53)		Good (n=233)		Chi-square	p
	n	%	n	%	n	%		
Age								
Less than 25 years (n=114)	8	7	26	22.8	80	70.2	6.256	0.044
Over 25 years (n=186)	6	3.2	27	14.5	153	82.3		
Number of children								
Less than 2 children (n=145)	8	5.5	30	20.7	107	73.8	5.786	0.216
3–5 children (n=119)	5	4.2	14	11.8	100	84.0		
More than 5 children (n=36)	1	2.8	9	25	26	72.2		
Place of residence								
Urban (n=177)	8	4.5	31	17.5	138	78.0	0.031	0.985
Rural (n=123)	6	4.9	22	17.9	95	77.2		
Marital status								
Married (n=279)	13	4.7	48	17.2	218	78.1	1.861	0.761
Divorced (n=11)	1	9.1	3	27.3	7	63.6		
Widowed (n=10)	0	0.0	2	2.0	8	80.0		
Educational level								
Illiterate (n=40)	2	5	13	32.5	25	62.5	7.126	0.028
Literate (n=260)	12	4.6	40	15.4	208	80.0		
Employment status								
Employed (n=40)	1	2.5	6	15.0	33	82.5	0.789	0.674
Unemployed (n=260)	13	5	47	18.1	200	76.9		
Monthly income (YRs)								
Less than 60,000 YRs (n=56)	5	8.9	9	16.1	42	75.0	3.308	0.508
60001–90000 YRs (n=187)	7	3.7	32	17.1	148	79.1		
Over 90,000 YRs (n=57)	2	3.5	12	21.1	43	75.4		

or younger, a difference that was statistically significant (p=0.044). Similarly, 80% of literate mothers exhibited good knowledge, a proportion significantly higher than that of illiterate mothers (p=0.028). Additionally, the data showed that 84% of mothers with three to five children demonstrated good knowledge, compared to 73.8% of those with one to two children and 72.2% of mothers with more than five children. Regarding place of residence, the majority of mothers from both urban (78%) and rural areas (77.2%) demonstrated good knowledge about childhood vaccination.

Discussion

Immunization programs have been instrumental in preventing a wide range of infectious diseases, particularly among children under five years of age.[8] To improve the effectiveness of childhood immunization initiatives, it is essential to raise awareness and enhance knowledge among parents, especially mothers and primary caregivers.[9] This study focused on mothers in Yemen, a country where ongoing conflict, worsening health conditions, and limited access to quality healthcare services create significant barriers to immunization.[10,11] According to a 2024 UNICEF (United Nations Children's Fund) report, vaccination coverage in Yemen remains critically low.[12] Furthermore, only one relevant study was identified, conducted in 2018 in Al-Mukalla, Yemen, titled "*Knowledge and Attitude towards Childhood Immunization among Parents in Al-Mukalla, Yemen*."[13] The results of that study revealed that parents possessed a moderate level of knowledge regarding childhood immunization. This highlights the urgent need for updated research and targeted interventions to address knowledge gaps and improve immunization coverage in Yemen's current sociopolitical context. Therefore, the present study is important for understanding mothers' knowledge of vaccination in Ibb Governorate, Yemen.

In the current study, more than three-fifths of the mothers were over 25 years of age, with a mean age of 30.4±8.7 years. These findings differ from those reported in a previous study conducted in Yemen.[10] The discrepancy between the two studies may be attributed to the fact that the current research was conducted in a healthcare facility, where nearly three-fifths of the mothers lived in urban areas and the majority were literate.

The findings also indicated that most mothers were aware that children should receive mandatory vaccinations. This is consistent with the results of a similar study conducted in Saudi Arabia.[14] Vaccinations should begin at birth to prevent and protect children from common communicable diseases.[15] Furthermore, the current study revealed that the majority of mothers recognized the importance of initiating vaccinations on the first day of birth, an observation also reported in a study conducted in Erbil, Iraq.[16] These findings suggest a foundational level of awareness among mothers regarding vaccination schedules, which can be leveraged to design more effective educational campaigns and promote timely immunization uptake in Ibb Governorate.

Additionally, all recommendations issued by the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) regarding the prevention and control of tetanus, diphtheria, and pertussis in the United States were followed.[17] In the current study, most mothers identified vaccination as a preventive measure against infectious diseases and as a means of controlling diphtheria, tetanus, pertussis, and measles. These findings are consistent with those of previous studies.[18] While vaccination can lead to local side effects such as swelling, redness, and pain at the injection site, as well as systemic reactions including fever and rash,[19] the majority of mothers in this study reported being aware of those side effects, particularly fever and pain. Notably, the level of awareness in this study was higher than that reported in a study conducted in Türkiye, where the awareness rate was 88.5%.[20] This elevated awareness of vaccine side effects among mothers participating in this study may contribute to better management of post-vaccination symptoms and help reduce vaccine hesitancy, thereby supporting higher immunization rates within the community.

In cases where vaccination poses an increased risk of serious adverse reactions in children, immunization should be postponed; however, most contraindications are temporary in nature.[21] Once the contraindicating condition resolves, the child may safely receive the scheduled vaccines.[22] In the present study, more than half of the mothers correctly reported that malnutrition, mild fever, and diarrhea are not valid contraindications to vaccination. These findings are consistent with those reported in a previous study.[23] The results from our study indicate a relatively good understanding among mothers regarding vaccination safety, which is crucial for minimizing unnecessary delays and ensuring the timely immunization of children, particularly through the implementation of health education sessions targeting the Yemeni population.

The overall assessment of mothers' knowledge regarding childhood vaccination showed that more than three-quarters demonstrated a good level of knowledge. This proportion is significantly higher than that reported in a study conducted in Nigeria, where only 44.8% of mothers exhibited good knowledge.[24] These findings suggest that educational efforts in the study area may be more effective, highlighting the potential to further improve immunization rates by building on this existing knowledge base. This can be achieved by ensuring vaccine availability, improving access to vaccination services, and increasing awareness among both healthcare workers and parents.

A statistically significant association was observed between mothers' total knowledge scores and their age groups; specifically, the majority of mothers over the age of 25 demonstrated good knowledge. This result is consistent with findings from a study conducted in the Sandakan District, Sabah, which also reported a statistically significant relationship.[25] Additionally, a significant association was found between knowledge scores and mothers' educational levels, with approximately four-fifths of literate mothers displaying good knowledge. This finding corroborates the results of a similar study.[26] These associations highlight the importance of tailoring educational interventions to younger and less-educated mothers to close knowledge gaps and enhance childhood immunization coverage.

Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design limits the ability to infer causality between mothers' knowledge and their vaccination practices. Additionally, the study was conducted in a single governorate (Ibb), which may limit the generalizability of the results to other regions of Yemen or similar contexts. Limited access to remote or conflict-affected areas may have excluded certain populations, potentially affecting the representativeness of the sample. Future research should consider using longitudinal designs and broader geographic coverage to validate and expand upon these findings.

Conclusion

The findings of this study highlight that the majority of mothers possess good knowledge regarding childhood vaccinations. Sociodemographic factors, particularly maternal age and level of education, were found to significantly influence their knowledge. Furthermore, most mothers recognized the critical role of vaccines in preventing infectious diseases and reducing infant mortality. However, approximately one-third of the mothers demonstrated insufficient knowledge, indicating the need for targeted educational interventions to enhance awareness and understanding of childhood immunization. Based on the findings of this study, several recommendations are proposed. Future research should be carried out in primary healthcare units to assess the knowledge of healthcare staff especially nurses regarding childhood vaccinations. Health facility decision-makers should prioritize the implementation of awareness programs, such as video-based educational sessions, to enhance public understanding of vaccinations. Mothers who visit primary healthcare units for routine immunizations should be provided with structured educational information about vaccinations, delivered by nursing staff. Additionally, further studies are recommended in rural areas to evaluate the vaccination-related knowledge of both mothers and healthcare providers.

Ethics Committee Approval: The study was approved by the Jiblah University for Medical and Health Sciences, Faculty of Nursing Research Ethics Committee (Approval Number: 2024.2.5,, Date: 08.09.2024).

Informed Consent: Verbal consent was obtained from all participating mothers prior to data collection.

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